

Spanish.

SPAN 495, 496: Special Topics in Spanish (1-3, 1-3)

Prerequisite: SPAN 202

An advanced study of special topics of literature or culture in Spain and/or Latin America. Conducted in Spanish.

SPAN 497: Independent Research (1-3)

Prerequisite: SPAN 202

SPAN 498: Study Abroad (9-18)

Prerequisite: SPAN 202

For those students who spend a summer or a semester abroad in an approved institution. Specific course credit will be determined upon the presentation of an official transcript from the chosen institution. Students will be registered in an audit status until transcripts are received.

**DEPARTMENT OF MATHEMATICS
AND COMPUTER SCIENCE**

UVA-WISE

Chair: C. Alex Edwards

Morris Akers, Paul Burchett, Rachel Clay-Keohane, P. Douglas Elosser, Matthew Harvey, David Baird Lane, Michael D. Potter, Abrar Qureshi, Kaushiki Saha, Jacob Somervell, James A. Vance, Jennifer Wilson

The Department of Mathematics and Computer Science offers courses in mathematics, computer science and software engineering leading to majors in Mathematics, Computer Science, Management Information Systems and Software Engineering. Minors may be earned in Mathematics and Computer Science. General education courses and courses designed for students majoring in other disciplines are also provided.

GENERAL EDUCATION REQUIREMENTS

To earn a degree from UVA-Wise a student must complete six semester hours in mathematics. Entering students who have not completed this requirement are required to take a mathematics placement test administered by the department. Students may begin their study of mathematics with MATH 100, 101, 102, 111, 112, 115 or 204; however, if deficiencies are identified, students are required to satisfactorily complete MATH 090 before registering for a 100-level mathematics course. MATH 090 is a non-degree credit course. The department recommends the appropriate placement determined by the following criteria:

- 1) The student's SAT or ACT scores;
- 2) The student's high school record;
- 3) The student's score on the Mathematics Placement Exam.

MATH 301 and 302 do not satisfy general education requirements.

A 100-level course, with the exceptions of MATH 102 and MATH 118, may not be taken for credit after a 200- or higher level course has been completed successfully. A student cannot receive credit for both MATH 100 and MATH 101; however, a student who receives a grade of C- or lower in MATH 101 may take MATH 100 for credit and the grade in MATH 100 will replace the grade in MATH 101. Neither MATH 100 nor MATH 101 may be taken for credit after either MATH 111 or MATH 112 has been completed successfully. MATH 111 cannot be used in conjunction with MATH 100/101 to complete the General Education requirements in Mathematics.

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Students who place into MATH 112 and complete the course with a C or better will also receive credit for MATH 111. Students who place into MATH 115 and complete the course with a C or better will also receive credit for MATH 101.

Students who place into MATH 204 and complete the course with a C or better will also receive credit for MATH 111 and MATH 112. Students who score a 4 or 5 on the AB Advanced Placement Examination in Calculus and students who score a 3 on the BC Advanced Placement Examination in Calculus will receive credit for MATH 204 and will be placed into MATH 205. Students who score a 4 or 5 on the BC Advanced Placement Examination in Calculus will receive credit for both MATH 204 and 205.

MINOR IN COMPUTER SCIENCE

A minor in computer science consists of 18 semester hours of computer science, at least 12 of which must be in 300- or 400-level courses. The program of study must include COSC 181 or COSC 190, Fundamentals of Computer Programming; COSC 281, Data Structures; COSC 381, Algorithms, and must be approved by the chair of the department.

MINOR IN MATHEMATICS

A minor in mathematics consists of 18 semester hours of mathematics, at least 12 of which must be in 300- or 400-level courses. MATH 301, 302, 303 and 305 do not satisfy this requirement. The program of study must include MATH 204 and must be approved by the department chair.

TEACHER LICENSURE

Licensure to teach mathematics at two different levels, general mathematics and high school mathematics, may be obtained by completing the professional education courses for secondary level teachers as outlined on page 150-151 in addition to the requirements of the chosen major. Students are advised to consult the Director of the Teacher Education Program for specific requirements.

General Mathematics: This licensure requires 18 semester hours of credit in mathematics and licenses one to teach general, consumer, basic, career and shop mathematics. MATH 301 and 302 cannot be included in the 18 semester hours.

High School Mathematics: Licensure to teach high school mathematics requires 27 semester hours of mathematics, including calculus, modern algebra, geometry, probability and statistics, and a computer

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programming course. MATH 301 and 302 cannot be included in the 27 semester hours. Students whose interests are in teaching mathematics in the secondary schools must take COSC 181 or 190 and MATH 312: Introduction to Geometry and are encouraged to take MATH 320: Introduction to Number Theory.

Computer Science: Teacher licensure with an endorsement in computer science may be obtained by completing the general education requirements, the computer science major, the professional studies courses, and the teaching internship. For additional requirements and information relative to the Teacher Education Program, please contact the Director of Teacher Education.

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

The degree program in computer science is designed to prepare students for entry-level employment in computer applications and to provide background necessary for graduate work in computer science. The curriculum is designed to meet the standards of the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE).

The courses required for the Computer Science major are as follows: (Math and science classes count for math and science general education requirements.)

Mathematics requirement:

| | semester hours |
|--|----------------|
| MATH 118 Elementary Probability and Statistics | 3 |
| MATH 204 Calculus I | 4 |
| MATH 205 Calculus II | 4 |
| MATH 306 Calculus III | 4 |
| MATH 311 Ordinary Differential Equations | 3 |
| MATH 313 Linear Algebra | |

3

TOTAL

21

Science Requirement:

Choose three of the following:

| | |
|--|---|
| CHEM 101/111 College Chemistry and Lab | 4 |
| PHYS 301 Electronics (includes lab) | 4 |

222

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| | |
|--|-------|
| PHYS 311 /211 College Physics and Lab | 5 |
| PHYS 312 /212 College Physics II and Lab | 5 |
| TOTAL | 13 or |

14

Computer Science core

| | | |
|----------|--------------------------------------|---|
| COSC 181 | Foundations of Computer Programming | 4 |
| COSC 230 | Software Engineering | 3 |
| COSC 281 | Data Structures | 3 |
| COSC 340 | Database Design | 3 |
| COSC 371 | Discrete Structures | 3 |
| COSC 381 | Algorithm Analysis | 3 |
| COSC 400 | Operating Systems | 3 |
| COSC 415 | Artificial Intelligence and Robotics | 3 |
| COSC 420 | Programming Languages | 3 |
| COSC 430 | Computer Architecture | 3 |
| COSC 499 | Computer Science Seminar | 1 |

| | |
|--|---------------------|
| Computer language requirement (one course is required from the following) | 3 |
| COSC 221 | Programming in Ada |
| COSC 222 | Programming in Java |

| | |
|--|-------------------------|
| Mathematics related elective (one course must be included from the following) | 3 |
| COSC/MATH 338 | Numerical Methods |
| COSC 360 | Operations Research |
| COSC 440 | Computer Graphics |
| COSC 450 | Modeling and Simulation |

| | |
|--|---|
| Computer Systems Elective (two courses must be included from the following) | 6 |
| COSC 325 | UNIX Systems |
| COSC 326 | Introduction to Human - Computer Interaction |
| COSC 375 | Web Technologies |
| COSC 411 | Advanced Database Systems |
| COSC 435 | Computer Networks |
| COSC 490 | Information Characteristics |
| PHYS 301 | Electronics (cannot be double-counted as part of Science requirement) |

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TOTAL

44

The Computer Science major requires a total of 64 semester hours above general education requirements. A student must complete a total of 120 semester hours in order to graduate. All students seeking a degree in Computer Science must perform satisfactorily on comprehensive examinations administered by the department. The examinations will cover the computer science core courses.

**BACHELOR OF SCIENCE
IN MANAGEMENT INFORMATION SYSTEMS**

The Bachelor of Science in Management Information Systems degree is designed to prepare students for entry-level employment in technology related management positions and to provide the background necessary for graduate work in Management Information Systems.

The courses required for the Management Information Systems major are:

| <i>Business Course Requirements:</i> | <i>semester hours</i> |
|--|-----------------------|
| COMM 100 Public Speaking or | 3 |
| COMM 340 Business and Professional Communication | |
| ACCT 201 Principles of Accounting I | 3 |
| ACCT 202 Principles of Accounting II | 3 |
| ECON 205 Microeconomic Principles | 3 |
| ECON 206 Macroeconomic Principles | 3 |
| BUAD 318 Marketing | 3 |
| BUAD 325 Applied Statistics | 4 |
| BUAD 331 Principles of Management | 3 |
| TOTAL SEMESTER HOURS | 25 |

| <i>Computer Science Courses:</i> | <i>semester hours</i> |
|---|-----------------------|
| COSC 110 Computer Literacy | 3 |
| COSC 190 or 181 Fundamentals of Programming | 4 |
| MATH 118 Elementary Prob. and Stat. | 3 |
| COSC 281 Data Structures | 3 |
| COSC 230 Software Engineering | 3 |
| COSC 340 Database Design and Applications | 3 |

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| | |
|--|---|
| COSC 360 Operations Research | 3 |
| COSC 411 Advanced Database Systems | 3 |
| COSC 450 Modeling and Simulation | 3 |
| MIS 498 Management Information Systems Seminar | 1 |

TOTAL SEMESTER HOURS

29

The major consists of 57 semester hours of business and computer science courses.

**BACHELOR OF ARTS OR BACHELOR OF SCIENCE
IN MATHEMATICS**

MATHEMATICS MAJOR

For all baccalaureate degrees with a major in mathematics, students must complete either a minor in another discipline or a second major.

All mathematics majors are required to complete the following core courses:

| | <i>semester hours</i> |
|--|-----------------------|
| MATH 204 Calculus I | 4 |
| MATH 205 Calculus II | 4 |
| MATH 306 Calculus III | 4 |
| MATH 311 Ordinary Differential Equations | 3 |
| MATH 313 Introduction to Linear Algebra | 3 |
| MATH 325 Probability and Statistics | 3 |
| MATH 335 Abstract Algebra I | 3 |
| MATH 340 Multivariable Calculus | 3 |
| MATH 344 Advanced Calculus I | 3 |
| MATH 490 Mathematics Seminar | 1 |

TOTAL SEMESTER HOURS

31

At least 12 additional semester hours of advanced work in mathematics numbered 310 or above or computer science numbered 300 or above are also required. These courses are to be selected in consultation with the academic advisor and approved by the chairman of the department. The student should use these courses to develop an area of special interest.

Students whose interests are in applied mathematics or computer science are encouraged to select from the following courses:

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| | <i>semester hours</i> |
|--|-----------------------|
| COSC 330 Fundamentals of Computer Science | 3 |
| COSC 360 Operations Research | 3 |
| COSC 371 Discrete Structures | 3 |
| COSC 450 Modeling and Simulation | 3 |
| MATH 338 Introduction to Numerical Methods | 3 |
| MATH 408 Applied Statistics | 3 |

Students whose interests are in pure mathematics are encouraged to select from the following courses:

| | <i>semester hours</i> |
|--|-----------------------|
| MATH 312 Introduction to Geometry | 3 |
| MATH 320 Introduction to Number Theory | 3 |
| MATH 331 Introduction to Mathematical Proofs | 3 |
| MATH 410 Set Theory | 3 |

Students whose interests are in teaching mathematics in the secondary schools must take COSC 181 or 190 and MATH 312: Introduction to Geometry and are encouraged to take MATH 320: Introduction to Number Theory.

These students are encouraged to select their remaining area electives from the following courses:

| | <i>semester hours</i> |
|--|-----------------------|
| COSC 360 Operations Research | 3 |
| COSC 371 Discrete Structures | 3 |
| MATH 315 History of Mathematics | 3 |
| MATH 320 Introduction to Number Theory | 3 |
| MATH 331 Introduction to Mathematical Proofs | 3 |
| MATH 410 Set Theory | 3 |

All students seeking a major in mathematics must perform satisfactorily on comprehensive examinations administered by the department. The examination will cover the contents of MATH 204, 205, 306, 311, 313, 325, 335, 344 and 345.

Courses may be applied toward two majors where appropriate; however, the course of study submitted for a major may not contain any courses used for the minor.

For the Bachelor of Arts degree in mathematics, students may elect a minor offered in the following areas:

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- History and Philosophy
- International Studies
- Language and Literature
- Visual and Performing Arts
- Women's Studies.

For the Bachelor of Science degree in mathematics, students may elect a minor offered by the following departments:

- Business and Economics
- Education
- Mathematics and Computer Science
- Natural Science
- Social and Behavioral Sciences.

**BACHELOR OF SCIENCE
IN SOFTWARE ENGINEERING**

The degree program in Software Engineering is designed to prepare students for entry-level employment in computer software development and to provide preparation for graduate work in software engineering or computer science. This curriculum uses as its basis the standard curriculum published by the Association for Computing Machinery (ACM) and the Institute for Electrical and Electronics Engineers (IEEE).

General education requirements should be selected with care. For example, the mathematics and physics requirements of this degree meet general education requirements. The major includes mathematics, physics, and computer science requirements as well as the software engineering requirements.

| <i>General Computer Science:</i> | <i>semester hours</i> |
|---|-----------------------|
| COSC 181 Fundamentals of Programming | 4 |
| COSC 230 Introduction to Software Engineering | 3 |
| COSC 281 Data Structures | 3 |
| COSC 326 Human-Computer Interaction | 3 |
| COSC 340 Database Design | 3 |
| COSC 371 Discrete Mathematics | 3 |
| COSC 381 Algorithms | 3 |
| COSC 400 Operating Systems | 3 |
| COSC 420 Programming Languages | 3 |
| COSC 430 Computer Architecture | 3 |

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Mathematics:

| | |
|---|---|
| MATH 118 Probability and Statistics | 3 |
| MATH 204 Calculus I | 4 |
| MATH 205 Calculus II | 4 |
| MATH 306 Calculus III | 4 |
| MATH 313 Introduction to Linear Algebra | 3 |

Science:

| | |
|---|---|
| PHYS 311/211 College Physics I and Lab | 5 |
| PHYS 312/212 College Physics II and Lab | 5 |

Non-technical Support:

| | |
|---------------------------------|---|
| COMM 345 Technical Writing | 3 |
| SWEG 179 Engineering Leadership | 3 |
| SWEG 279 Engineering Economics | 3 |

Software Engineering Core Requirements:

| | |
|---|---|
| SWEG 213 Software Construction Technology | 3 |
| SWEG 221 Testing, Verification and Validation | 3 |
| SWEG 321 Software Quality Assurance | 3 |
| SWEG 322 Software Requirements and Modeling | 3 |
| SWEG 323 Software Configuration Management | 3 |
| SWEG 424 Software Project Management | 3 |
| SWEG 498/499 Capstone Project | 6 |

TOTAL SEMESTER HOURS 92

COURSES IN COMPUTER SCIENCE

COSC 101: Object Oriented Programming (3)

Programming in C++ as an introduction to computer programming for non-majors. Variables, declarations, branching, looping, and arrays. Computer science majors and minors cannot get credit for this course after taking COSC 181 or COSC 190.

COSC 110: Computer Literacy (3)

Basic concepts of computer hardware and software, word processing, spreadsheets, database use, Internet use, graphic presentations, introduction to object oriented programming. Students may not receive

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credit for both COSC 110 and BUAD 111.

COSC 135: Computer Network Assembly (1)

Assembly and testing of local area networks for offices and schools. Selection of components, software for networks and labs.

COSC 181: Foundations of Computer Programming in C/C++ (4)

Beginning computer programming. C/C++ language syntax, data types, sequence, branch, loop, and select constructs, pointer variables, record structures, input/output, and programming techniques. Student cannot receive credit for both COSC 181 and COSC 320.

COSC 221: Programming in Ada (3)

Prerequisite: COSC 181 with a C or better

Programming in Ada language syntax, generics, tasking and parallel processing, synchronization, large system software engineering, object oriented systems, tagged types, inheritance, packages, exception handlers. Students cannot receive credit for both COSC 321 and COSC 190.

COSC 222: Programming in Java (3)

Prerequisite: COSC 181 or COSC 190 with a C or better

Programming in Java language syntax, Java virtual machines, classes, applets, multithreading, Java streams, libraries, user interfaces, network interfaces.

COSC 230: Software Engineering (3)

Prerequisite: One computer language course

Development of a total system concept is emphasized. Project planning, requirements analysis, system design, program design, program implementation, program testing, system testing, system delivery, maintenance, documentation, and examining the development process.

COSC 281: Data Structures (3)

Prerequisite: COSC 181 or COSC 190 with a C or better

Data and abstract data types; programming principles, lists, dynamic memory allocation, stacks, queues, trees, graphs, recursion.

COSC 325: Unix Systems (3)

Prerequisite: COSC 181 with a C or better or permission of instructor.

Detailed study of the UNIX operating system; UNIX commands; File

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system; software development tools; system call interface and standard C library; Process control and inter-process communication; graphical user interfaces, Shell scripts and scripting languages; networking; variations of the UNIX system.

COSC 326: Introduction to Human - Computer Interaction (3)

Prerequisite: COSC 181 or COSC 190 with a C or better

User-centered graphical user interface (GUI) development concepts and application, iterative development process, activity, information, interaction design, prototyping tools, user testing, event-based programming, cognitive walkthroughs, heuristic evaluation, lab based testing.

COSC 330: Fundamentals of Computer Science (3)

Prerequisite: COSC 181 or COSC 190 or permission of instructor

Course does not count for Computer Science majors

Overview of how computer systems process information. Topics include fundamentals of high order languages, machine languages, assembly languages, operating systems, computer architecture, and computer networks. Programming exercises in a high level language and an assembly language; searching and sorting algorithms, recursion. Intended for computer science, mathematics, and science majors who want an overall view of computer science.

COSC 338: Introduction to Numerical Methods (3)

Prerequisites: MATH 205 or permission of instructor

The theory and techniques of numerical computation involving interpolation methods; solution of systems of equations and methods of solving ordinary differential equations. Practice in the use of modern computers and programming. (Dual listing with MATH 338.)

COSC 340: Database Design and Applications (3)

Prerequisite: COSC 281 with a C or better

Evolution of data models, relational, network, hierarchical, and ER model concepts. DDL and DML concepts, relational algebra, relational calculus, SQL, Network and Hierarchical DMLs. Design, implementation, and manipulation of a relational database using current database technology.

COSC 360: Operations Research (3)

Prerequisite: One year of college-level mathematics

An introduction to the theory and techniques of operations research.

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Topics include mathematical modeling and simulation, linear programming and queuing. Practical examples are emphasized throughout the course.

COSC 371: Discrete Structures (3)

Prerequisite: MATH 204 or permission of instructor

Topics include: algebra of sets, equivalence relations, counting techniques, induction, algebraic structures, flowcharts, algorithms, syntax and semantics, graphs, monoids and machines and logic.

COSC 375: Web Technologies (3)

Prerequisite: COSC 281

This course covers the design, implementation, and testing of interactive web applications. Focus will be on web programming technologies (Javascript, Perl, PHP, CSS, jsp, ASP, etc.). Students will learn how to build complex web applications.

COSC 381: Introduction to Algorithms (3)

Prerequisite: COSC 281 and MATH 306 with a C or better or permission of instructor

Sorting and searching; recursion; analysis of complexity; algorithm paradigms; NP complete problems; complexity metrics.

COSC 387, 388: Cooperative Education Project I (1-6, 1-6)

Students can obtain information from the Department Chair.

COSC 395, 396: Special Topics (1-3, 1-3)

Prerequisite: Permission of instructor

COSC 400: Operating Systems: Theory and Practice (3)

Prerequisite: COSC 281 with a C or better

The concepts behind the design and working of the operating system on a computer are introduced. A system programming course emphasizing topics such as resource management, processes, process management, file design and allocation, system calls, and shell design.

COSC 411: Advanced Database Systems (3)

Prerequisite: COSC 340

Advanced database design concepts, multivalued dependencies, functional dependencies, normalization. Concurrency control and recovery techniques, serializability, deadlocks, distributed databases,

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object-oriented databases, and current trends in database systems. Relational database implementation and manipulation using SQL embedded in various programming languages.

COSC 415: Introduction to Robotics and Artificial Intelligence (3)

Prerequisite: COSC 281 with a C or better or permission of instructor

Intelligent agents, knowledge representation, inference, reasoning, planning, learning perception, robotic control.

COSC 420: Programming Languages (3)

Prerequisite: COSC 281 with a C or better and senior standing

Survey of contemporary languages, compiler construction techniques, parsing, formal grammars, virtual machines, subprograms, functional and logic programming.

COSC 430: Computer Architecture (3)

Prerequisite: COSC 281 and COSC 371 with a C or better

A detailed study of the design and functional organization of a modern digital computer. Instruction sets, I/O handling, interrupts, addressing schemes, microprogramming and memory management are investigated.

COSC 435: Computer Networks (3)

Prerequisite: COSC 281 with a C or better or permission of instructor

Network structure, architectures, network standardization, TCP/IP reference model and different network layers, Local Area Network protocols, routing algorithms, internetworking.

COSC 440: Computer Graphics (3)

Prerequisites: COSC 281, MATH 205 and MATH 313 with a C or better

Concepts of representation, manipulation, and rendering of graphical objects, concept of developing graphical user interface (GUI), devices for graphical input, graphics software, graphics standards; simple algorithms for line, circle, box, polygon drawing; attributes of lines and other geometrical shapes, attributes of text; 2D representation, scaling, rotating, etc.; 3D graphics; hidden line removal; rendering objects.

COSC 445: Introduction to Compilers (3)

Prerequisite: COSC 281 with a C or better

Concepts behind programming languages, their structure, and grammar. Use of these concepts to design and implement a simple translator. Sets and strings, grammars and their classification, context-free grammar and parsing; programming language design, design philosophies; top-down

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parsing, LL(1) grammars; bottom-up parsing, polish notation, simple precedence grammars, LR grammars.

COSC 450: Modeling and Simulation (3)

Prerequisites: COSC 181 or COSC 190 and MATH 118 with a C or better

An introduction to model building and simulation techniques.

Experimental design and statistical analysis of business, social and physical science systems.

COSC 487, 488: Cooperative Education Project II (1-6, 1-6)

Students can obtain information from the Department Chair.

COSC 490: Information Characteristics (3)

Prerequisite: COSC 281 with a C or better

State machines, information measurement, software metrics, reliability, binary codes, encryption, data compression, pattern recognition, and information recovery.

COSC 494: Special Studies in Computer Science (1-3)

Prerequisite: Two programming languages and permission of instructor

Students select appropriate topics from within their field of interest.

Problem analysis and selection of an appropriate solution is emphasized.

COSC 495, 496: Special Topics (1-3, 1-3)

Prerequisite: Permission of instructor

COSC 497: Independent Study (1-3)

COSC 499: Computer Science Seminar (Capstone Course) (1)

Prerequisite: Permission of instructor

Students select and present appropriate topics from within their field of interest.

COURSES IN MANAGEMENT INFORMATION SYSTEMS

MIS 498: Management Information Systems Seminar (1)

Prerequisite: Permission of instructor

A senior capstone course in which students select and present projects

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developed in information system management, to illustrate mastery of knowledge and skills acquired in their major discipline over the course of their studies at UVa-Wise.

COURSES IN MATHEMATICS

MATH 090: Mathematics (3)

Fundamental arithmetic operations; basic algebraic processes; linear equations in one and two unknowns; polynomials; factoring trinomials; solutions of quadratic equations. (A remedial course designed for students who are not prepared to take college-level mathematics courses. Offered for credit/no credit only.)

MATH 100: Introduction to Algebra (4)

Prerequisite: Departmental placement or successful completion of MATH 090
Review of basic algebraic processes; relations and functions; linear equations and inequalities; graphing of linear and quadratic function; ratio and proportion; complex numbers; quadratic equations; exponential and logarithmic functions. (A course meeting five days a week designed for students who are not prepared to take MATH 101. A student may not receive credit for both MATH 100 and MATH 101.)

MATH 101: College Algebra (3)

Prerequisite: Satisfactory performance on placement test or successful completion of MATH 090

Relations and functions; linear equations and inequalities; graphing of linear and quadratic functions; ratio and proportion; complex numbers; quadratic equations; exponential and logarithmic functions. (No credit is given for this course if a student has satisfactorily completed MATH 100, MATH 103 or above.)

MATH 102: Finite Mathematics (3)

Prerequisite: Satisfactory performance on placement test or successful completion of MATH 090

Algebra of sets; permutations and combinations; probability; elementary statistics; systems of linear equations and linear inequalities; matrix algebra; linear programming, and mathematics of finance. Emphasis is given to learning practical applications. (A course of interest to business and social science majors. This course is required for students seeking an elementary education endorsement to teach Pre-K-6 level.)

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MATH 111: Precalculus I (3)

Prerequisite: Satisfactory performance on the placement test or completion of MATH 100 or MATH 101 (grade of C or better)

Algebra review; Cartesian plane; circles and the distance formula; functions and graphs; symmetry; domain and range; lines and linear applications; parabolas and quadratic applications; higher order polynomials. (This course may not be used along with MATH 100/101 to satisfy the six hour general education requirement.)

MATH 112: Precalculus II (3)

Prerequisites: Satisfactory performance on placement test or successful completion of MATH 111 (grade of C or better) or permission of instructor
Rational functions; inverse functions; exponents and logs; degrees and radians; arclength and sector area; trig functions on triangles and on the circle; trig graphs; trig identities; law of sines and cosines. Logarithm, exponent and trig applications are heavily emphasized.

MATH 115: Applications of Mathematics (3)

Prerequisite: Satisfactory performance on placement test or successful completion of MATH 100 or MATH 101, or MATH 111 (grade of C or better)

An applications based course in mathematics including topics in logic, personal and business finance, statistical reasoning, probability, and mathematical modeling. Emphasis will be given to problem solving and real world settings.

MATH 118: Elementary Probability and Statistics (3)

Prerequisite: MATH 101 or MATH 111 or permission of instructor

Rules of probability; random sampling; binomial and normal distributions; Chi-Square, T- and F-distributions; hypotheses testing; linear regression and correlation.

MATH 194, 195: Special Topics (1-3, 1-3)

Prerequisite: Permission of instructor

MATH 204: Calculus I (4)

Prerequisite: MATH 112 with a C or better or permission of instructor

Limits and continuity; differentiation of algebraic functions; derivative as a rate of change; maxima and minima; integration of algebraic functions; definite integrals and applications.

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MATH 205: Calculus II (4)

Prerequisite: MATH 204 with a C or better or permission of instructor

Differentiation and integration of exponential, logarithmic and trigonometric functions; polar coordinates; parametric equations; arc length; area of surface of revolution; volume by the disk, washer and shell methods; indeterminate forms and improper integrals.

MATH 301: Euclidean Geometry (3)

Prerequisite: MATH 102 or MATH 112 or MATH 118.

An application-oriented study of Euclidean geometry for students whose interests are in teaching K-8. Topics that will be emphasized include: foundations of geometry; introduction to proofs; triangles; parallel lines and polygons; ratio, proportion and similarity; right triangles and the pythagorean theorem; circles; and solid geometry. (*MATH 301 does not satisfy the general education requirement or count toward a major or minor in mathematics.*)

MATH 302: Problem Solving (3)

Prerequisite: MATH 102 or MATH 112 or MATH 118.

A study of topics from the foundations of mathematics, with emphasis on problem solving. Topics will include: steps in problem solving in mathematics; elementary set theory; elementary logic and mathematical proofs; elementary number theory; properties of integers and properties of rational numbers; lines and linear functions; combinatorics and probability; elementary statistics; sequences; and systems of linear equations. (*MATH 302 does not satisfy the general education requirement or count toward a major or minor in mathematics.*)

MATH 303 Linear Algebra for Teachers (3)

Prerequisite: MATH 204 with a C or better or permission of instructor

An application oriented study of linear algebra for students whose interests are in teaching K-8. Topics that will be emphasized include: systems of equations; vector spaces; subspaces; linear dependence and independence; linear transformations; matrices and matrix algebra; determinants; and eigenvalues and eigenvectors. (*MATH 303 does not count toward a major or minor in mathematics.*)

MATH 305 History of Mathematics for Teachers

Prerequisite: MATH 100 or MATH 101, or MATH 111

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An application oriented study of the history of mathematics for students whose interests are in teaching K-8. Emphasis is given to mathematicians and their contributions with a focus on various applications of their work. (Math 305 does not count toward a major or minor in mathematics.)

MATH 306: Calculus III (4)

Prerequisite: MATH 205 with a C or better or permission of instructor
 Infinite series; lines and planes in space; vector-valued functions; functions of several variables; partial derivatives; gradients; maxima and minima; multiple integration.

MATH 311: Ordinary Differential Equations (3)

Prerequisite: MATH 205 with a C or better or permission of instructor
 A study of differential equations of the first order, linear differential equations and their applications, and other selected topics.

MATH 312: Introduction to Geometry (3)

Prerequisite: MATH 331 with a C or better or permission of instructor
 The history and development of Euclidean and non-Euclidean geometries. The axiomatic method and techniques of proof are emphasized.

MATH 313: Introduction to Linear Algebra (3)

Prerequisite: MATH 204 with a C or better or permission of instructor
 Vector spaces; subspaces; linearly dependent and independent subsets; linear transformations; matrices; determinants; eigenvalues and eigenvectors.

MATH 315: History of Mathematics (3)

Prerequisite: MATH 204 or permission of instructor
 Emphasis is given to mathematicians and their contributions; various trends of mathematics of different eras. (A course of interest and benefit to teachers and prospective teachers of mathematics. MATH 315 does not satisfy the general education requirement.)

MATH 320: Introduction to Number Theory (3)

Prerequisite: MATH 331 with a C or better or permission of instructor
 Unique factorization theorem; linear Diophantine equations; linear congruences; Fermat's and Wilson's theorems; divisors of an integer;

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perfect numbers; Euler's theorem; numbers of other bases; quadratic congruences and reciprocity. (A course of interest and benefit to prospective teachers of mathematics.)

MATH 325: Probability and Statistics I (3)

Prerequisite: MATH 205 with a C or better or permission of instructor
Probability in finite, discrete and general spaces; discrete and continuous random variables; conditional and independent joint distributions; confidence intervals; testing hypotheses; regression and correlation; sampling methods.

MATH 331: Introduction to Mathematical Proofs (3)

Prerequisite: MATH 205 with a C or better or permission of instructor
Writing mathematical proofs. Exercises in set theory, number theory. Includes set operations, equivalence relations, induction, completeness property, Archimedean property and the Fundamental Theorem of Arithmetic.

MATH 335: Abstract Algebra I (3)

Prerequisite: MATH 331 with a C or better or permission of instructor
Groups; cyclic groups; normal subgroups; Lagrange's theorem; permutation groups; group homomorphisms; Cayley's theorem; elementary theory of rings and fields.

MATH 338: Introduction to Numerical Methods (3)

Prerequisites: MATH 205 with a C or better or permission of instructor
The theory and techniques of numerical computation involving interpolation methods; solution of systems of equations and methods of solving ordinary differential equations. Practice in the use of modern computers and programming. (Dual listing with COSC 338.)

MATH 340: Multivariable Calculus (3)

Prerequisites: MATH 313 and MATH 306
Geometry of Euclidean space, cylindrical and spherical coordinate systems, functions from \mathbb{R}^n to \mathbb{R}^m , limits and continuity, partial derivatives, Jacobean matrix, double and triple integrals, vector fields, divergence and curl, parametric equations of curves and surfaces, line and path integrals. Additional topics such as surface integrals, Green's and Stokes' theorems will be covered as time permits.

MATH 344: Advanced Calculus I (3)

MATHEMATICS AND COMPUTER SCIENCE

Prerequisite: MATH 331 with a C or better or permission of instructor
The real number system; differential and integral calculus of one variable; uniform continuity; Taylor's theorem; infinite sequences and series; uniform convergence; real-valued functions of several variables.

MATH 387, 388: Cooperative Education Project I (1-6, 1-6)
Students can obtain information from the Department Chair.

MATH 394, 395, 396: Special Topics (1-3)
Prerequisite: MATH 205 and permission of instructor
Advanced undergraduate mathematics topics.

MATH 408: Applied Statistics (3)
Prerequisite: MATH 208/325 or permission of instructor
Design of experiments; hypothesis testing; multivariate statistical analysis; analysis of variance and covariance; regression analysis; nonparametric statistics.

MATH 410: Set Theory (3)
Prerequisite: MATH 205 or permission of instructor
Axiomatic development of sets that includes operations on sets; relations; order; the axiom of choice; Zorn's lemma; Schroeder-Bernstein theorem.

MATH 426: Probability and Statistics II (3)
Prerequisite: MATH 325 with a C or better
A continuation of MATH 325.

MATH 436: Abstract Algebra II (3)
Prerequisite: MATH 335 with a C or better
Structure of finite groups; ideal theory of commutative rings; Galois fields.

MATH 445: Advanced Calculus II (3)
Prerequisite: MATH 344 with a C or better
A continuation of MATH 344.

MATH 487, 488: Cooperative Education Project II (1-6, 1-6)
Students can obtain information from the Department Chair.

MATH 490: Mathematics Seminar (Capstone Course) (1)
Prerequisites: MATH 306, Junior or Senior Status, declared major and approval

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of Department Chair.

This course should be taken concurrently with (or following) an approved advanced mathematics course. Study of a topic related to the material in advanced course will be required along with completion of project in consultation with the instructor. The student will be required to present a summary of the project, both orally and in writing, demonstrating critical thinking and problem-solving ability.

MATH 495, 496: Special Topics (1-3)

Prerequisite: MATH 306 and permission of instructor

Advanced undergraduate mathematics topics.

MATH 497: Independent Study (1-3)**COURSES IN SOFTWARE ENGINEERING****SWEG 179: Engineering Leadership (3)**

Professionalism, group dynamics, professional ethics, psychology, social responsibility of engineers, legal issues for engineers, negotiation skills, documentation practice.

SWEG 213: Software Construction Technology (3)

Prerequisite: COSC 230, COSC 281 with a C or better

Graphical languages, software metrics, automatic code generation, development tool integration, component library engineering, architecture styles and patterns, off-the-shelf software integration, development tools, evolutionary development strategies, formal design languages, state based and table based design, design patterns, object oriented design evaluation, efficiency, reliability, maintainability, design modification, reverse engineering.

SWEG 221: Testing, Verification and Validation (3)

Prerequisite: SWEG 230, COSC 281 with a C or better

Requirements oriented testing, test plan design, effective testing techniques, test coverage evaluation, statistical techniques for testing, reviews and inspections.

SWEG 279: Engineering Economics (3)*Prerequisite: MATH 204 with a C or better*

Supply and demand analysis, break-even analysis, cost benefit analyses, investments, marketing, time value of money, risk potentials.

SWEG 321: Software Quality Assurance*Prerequisite: SWEG 213, SWEG 221 with a C or better*

Inspection techniques, comprehensive test strategies, test coverage analysis, software process evaluation, process documentation, defect management, training documentation, inspection management tools.

SWEG 322: Software Requirements and Modeling (3)*Prerequisite: SWEG 213 with a C or better*

Elicitation of requirements, prioritization, goal analysis, validation criteria, feasibility analysis, ambiguity and clarity, functional and non-functional requirements, representation techniques, quality attributes, negotiations, feature interactions.

SWEG 323: Software Configuration Management (3)*Prerequisite: SWEG 213 with a C or better*

Configuration management, configuration tools, maintenance standards, verification and validation documentation, contract specifications, software library maintenance, project version interaction.

SWEG 424: Software Project Management (3)*Prerequisite: SWEG 321, SWEG 322, SWEG 323 with a C or better*

Project planning and documentation, management tools, cost estimation, productivity, metrics, options and risks, expectations management, contracts, intellectual property, process standards, long-term maintenance, progress measurement, earned value analysis, legal document management, project management standards.

SWEG 498/499: Capstone Project (3, 3)*Prerequisite or Co-requisite: SWEG 424*

Group project utilizing and demonstrating all software engineering skills of the major requirements. Student conceived and marketed product is developed with complete documentation, quality control, and configuration management.